

Table 1-1
Screening of Remedial Technologies - Soil
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

General Response Action	Remedial Technology	Process Option ⁽²⁾	Preliminary Screening of Remedial Technologies			Remedial Technology and Process Options Screening Criteria ⁽⁷⁾							
			Description	Retained	Retained/Rationale	Effectiveness Evaluation		Implementability Evaluation		Cost Evaluation		Retained	
No Action	No Action	No Action	No Remedial Action	Yes	As required by NCP and USEPA as a baseline for other process	Low	Does not result in a decreased residual risk; baseline conditions	High	Readily implementable	Low	Capital - None O&M - Low (for monitoring)	Yes	As required by NCP and USEPA as a baseline for other process
Monitoring	Monitoring	Monitor containment technologies/cover integrity	Monitoring of containment technologies/cover integrity	Yes	To supplement containment technologies/cover integrity	High	Effective to evaluate other technologies (e.g., containment) and ensure the technologies are functioning properly	High	Readily implementable	Low-Moderate	Capital - Low O&M - Low to Moderate	Yes	Standard practice for containment and capping technologies; implemented with other containment options
Institutional Controls	Institutional Controls	Proprietary Controls, Enforcement Tools, Deed Restrictions, and Information Devices	Administrative actions taken to minimize the potential for human exposure to constituents present by controlling land use and guiding human behavior.	Yes	Discourage non-applicable land use by imposing site restrictions and providing notification of constituents in media.	High	Effective in limiting future Site use; five-year review process ensures long-term effectiveness	Moderate/High	New Jersey has regulatory process for establishing land use restrictions; Requires coordination with property owner and regulatory authorities	Low	Capital - Low O&M - Low	Yes	Standard practice for landfill management; may be implemented with additional process options
Access Restrictions	Access Restrictions	Physical Barriers, Signage, and Security	Using physical barriers, signage, and security to prevent or discourage entry	Yes	To be used in conjunction with other remedial technologies	Moderate	Effectiveness may require monitoring	High	Readily implementable	Low/Moderate	Capital - Low to moderate O&M - Low to moderate	Yes	Standard practice for landfill management; implemented with additional process options
Containment	Soil Capping	Asphalt Cover	Prevent infiltration and direct contact with surface soil constituents.	Yes	Impermeable barrier that prevents contact with surface soil constituents and reduces infiltration.	Moderate	Prevents direct contact with contaminated soils and debris. Requires clearing of Site vegetation/destruction of habitat and placement of asphalt. Long-term success dependent on maintenance of cover.	Moderate	Standard technology but implementability reduced by limited truck access to site. Typically used in developed areas (e.g., parking lots).	Moderate	Capital - Moderate O&M - Moderate	No	Other low permeability covers offer same effectiveness and implementability at lower cost; no habitat will remain in asphalt-paved areas.
		Vegetative Cover	Prevent direct contact with a vegetative cover.	Yes	Prevents direct contact with surface soil constituents and reduces erosion and transport of constituents.	Moderate	Prevents direct contact with contaminated soils and debris. Requires clearing of Site vegetation/destruction of habitat and placement of clean soil. Long-term success dependent on maintenance of cover.	Moderate	Standard technology but implementability reduced by limited truck access to site.	Low/Moderate	Capital - Moderate O&M - Low	Yes	Standard containment process option; can be applied to portions of the site.
		Low-permeable Cover	Minimize infiltration and prevent direct contact.	Yes	Prevents direct contact with surface soil constituents and reduces infiltration.	Moderate	Prevents direct contact with contaminated soils and debris. Requires clearing of Site vegetation/destruction of habitat and placement of clean soil. Long-term success dependent on maintenance of cover.	Moderate	Standard technology but implementability reduced by limited truck access to site.	Moderate	Capital - Moderate O&M - Low	Yes	Standard containment process option; can be applied to portions of the site.
	Subsurface Source Controls	Low-permeable Liner	Minimize infiltration/leaching into subsurface	Yes	Reduces infiltration/leaching into subsurface	High	Minimizes infiltration of leachate into subsurface; may be used in areas where waste has been relocated	Low	Standard construction equipment, but may be limited by site conditions in some areas of the site and total volume of impacted material	High	Capital - High O&M - Low to Moderate	Yes	Standard containment process option; can be applied to portions of the site.

Table 1-1
Screening of Remedial Technologies - Soil
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

General Response Action	Remedial Technology	Process Option ⁽²⁾	Preliminary Screening of Remedial Technologies			Remedial Technology and Process Options Screening Criteria ⁽¹⁾							
			Description	Retained	Retained/Rationale	Effectiveness Evaluation		Implementability Evaluation		Cost Evaluation		Retained	
In-Situ Treatment	Physical/Chemical	Cementation Solidification/Stabilization	Use cementitious material (or similar) to immobilize constituents.	Yes	Immobilizes constituents thereby reducing concerns associated with direct contact and infiltration	Low	Constituents are incorporated into a dense structure that reduces mobility, limited effectiveness for VOCs, SVOCs, PAHs, and pesticides	Low	Standard construction equipment, but may be limited by site conditions (presence of municipal waste) and would require significant mixing of additives	Moderate	Capital - High O&M - Low to None	No	Implementability reduced by presence of municipal waste in soil. Unlikely to have degree of mixing and contact of cementitious material and soil needed to bind constituents.
		Oxidation/Reduction	Chemically transform hazardous constituents to non-hazardous or less toxic constituents	Yes	Stabilizes, immobilizes or makes inert constituents thereby reducing concerns associated with direct contact and infiltration	Moderate	Treats inorganics; less effective for some VOCs, SVOCs, and pesticides	Moderate	Potentially requires handling of large quantities of hazardous oxidizing chemicals, appropriate training, and treatability studies	Moderate	Capital - Moderate O&M - Moderate	Yes	Well-established technology for preventing mobilization of constituents; may be implemented with additional process options
		Precipitation/Co-precipitation	Convert soluble constituents into insoluble solids for precipitation and removal	Yes	Reduces infiltration/leaching into subsurface	Low	Not applicable to majority of constituents present; constituents remain in soil	Low	Not readily deployable to soil mixed with waste	Low/Moderate	Capital - Moderate O&M - Low to None	No	Less effective than other immobilization/containment options; requires additional containment to control direct contact
		Soil Vapor Extraction	Vacuum applied to extraction wells to facilitate volatilization of groundwater constituents such as VOCs	Yes	Combined with other technologies for enhancing constituent extraction and ex-situ treatment	Low	Removes VOCs from the subsurface for ex-situ treatment; effectiveness is low in areas where VOC concentrations are low	Low/Moderate	Potential limitations due to presence of waste (installation of wells and piping is difficult; heterogeneity not favorable to uniform air flow in the debris in media likely to cause operating difficulties and potentially safety issues; extraction rates varies; high moisture content limits effectiveness; power needs can be high	Moderate	Capital - Moderate (well installation and equipment) O&M - Low to Moderate	No	Unlikely to be effective given the low VOC concentrations at the site, and difficult to implement due to presence of waste.
		Thermal Treatment	Application of heat through various methods increases volatilization of SVOCs to facilitate extraction	Yes	Removes constituents for ex-situ treatment	Moderate	Treats some constituents (VOCs, SVOCs, pesticides); requires additional air stream treatment	Low		Moderate/High	Capital - Moderate to High (no adequate existing power available for most of site) O&M - Moderate	No	Implementability reduced by presence of municipal waste in soil. Costs potentially high.
	Biological	Bioventing	Oxygen is delivered to soil to facilitate biodegradation	No	Not established technology to treat many constituents present	-	-	-	-	-	-	-	-
		Enhanced Bioremediation	Water-based solutions circulated through media to stimulate natural microbial activity	No	Not established technology to treat many constituents present	-	-	-	-	-	-	-	-
		Phytoremediation	Plants used to remove, stabilize, or destroy constituents	Yes	Removes or immobilizes constituents thereby reducing concerns associated with direct contact and infiltration	Moderate	Effective for some constituents, but not all (e.g. PCBs); does not prevent direct contact without other process options	High	Readily implementable	Low/Moderate	Capital - Moderate O&M - Low	Yes	Can be combined with other process options to provide treatment of constituents present

Table 1-1
Screening of Remedial Technologies - Soil
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

General Response Action	Remedial Technology	Process Option ⁽²⁾	Preliminary Screening of Remedial Technologies			Remedial Technology and Process Options Screening Criteria ⁽¹⁾							
			Description	Retained	Retained/Rationale	Effectiveness Evaluation		Implementability Evaluation		Cost Evaluation		Retained	
Ex-Situ Treatment	Biological	Biopiles	Soils are excavated, mixed with amendments, and actively aerated to remove volatile	Yes	Removes constituents for ex-situ treatment	Moderate	Treats some constituents (VOCs, SVOCs, pesticides); requires additional air stream treatment	Low	Implementability reduced by presence of waste mixed in soil	Moderate	Capital - Moderate O&M - Moderate	No	Longer treatment times than other ex-situ biological treatments
		Landfarming	Soils are excavated, placed in containment and tilled to remove volatile constituents	Yes	Removes constituents for ex-situ treatment	Low	Does not treat inorganics; volatile constituents require pretreatment	Low	Requires large area	Moderate	Capital - Moderate O&M - Moderate	No	No feasible for volume of soil and number of constituents requiring treatment
		Slurry Phase Biological Treatment	Soils are mixed with water and admixtures to facilitate biodegradation	Yes	Removes constituents from impacted soil	High	Effective treatment for majority of constituents present	Low	Implementability reduced by presence of waste mixed in soil; dewatering and disposal of treated material and wastewater. May not be implementable for potential large volume of soil requiring treatment; presence of municipal waste will reduce make mixing/contact very difficult. Reactions between waste and chemicals cannot be predicted.	High	Capital - High O&M - High	No	Offers minimal benefit to off-site disposal
	Physical/Chemical	Chemical Extraction	Excavated soil is mixed with chemical extractant to dissolve constituents, which are then separated from extractant	Yes	Removes constituents from impacted soil	Moderate	Effective for some constituents (i.e., PCBs, VOCs, pesticides)	Low	May not be implementable for potential large volume of soil requiring treatment; presence of municipal waste will reduce make mixing/contact very difficult. Reactions between waste and chemicals cannot be predicted.	High	Capital - High O&M - Low to Moderate	No	Presence of waste reduces implementability of this technology
		Chemical Reduction/Oxidation	Chemically transform hazardous constituents to non-hazardous or less toxic constituents	Yes	Stabilizes, immobilizes or makes inert constituents thereby reducing concerns associated with direct contact and infiltration	Moderate	Treats inorganics; less effective for some VOCs, SVOCs, and pesticides	Low	May not be implementable for potential large volume of soil requiring treatment; presence of municipal waste will reduce make mixing/contact very difficult. Reactions between waste and chemicals cannot be predicted.	Moderate	Capital - Moderate O&M - Moderate	No	Presence of waste reduces implementability of this technology
		Separation	Constituents concentrated by physically or chemically separating constituents from the medium	Yes	Removes constituents from impacted soil	Moderate	Applicable to some constituents present (i.e., VOCs, SVOCs, pesticides and inorganics)	Low	May not be implementable for potential large volume of soil requiring treatment; presence of municipal waste will reduce make mixing and separation very difficult.	Moderate	Capital - Moderate O&M - Low/moderate	No	Presence of waste reduces implementability of this technology
Removal	Excavation	Excavation	Physically remove impacted soil	Yes	Well established technology for removing impacted soil.	High	Requires clearing of site vegetation and destruction of habitat. Removal of constituents from site reduces toxicity and volume of constituents	Low/Moderate	Standard construction equipment, but implementability may be reduced by limited truck access to site and by site conditions	High	Capital - High O&M - Low to None	Yes	Standard process option applicable to all constituents; implemented in conjunction with disposal
Removal	Excavation	Excavation	Physically remove impacted soil	Yes	Well established technology for removing impacted soil.	High	Requires clearing of site vegetation and destruction of habitat. Removal of constituents from site reduces toxicity and volume of constituents	Low/Moderate	Standard construction equipment, but implementability may be reduced by limited truck access to site and by site conditions	High	Capital - High O&M - Low to None	Yes	Standard process option applicable to all constituents; implemented in conjunction with disposal

Table 1-1
Screening of Remedial Technologies - Soil
Rolling Knolls Landfill Superfund Site
Chatham, New Jersey

General Response Action	Remedial Technology	Process Option ⁽²⁾	Preliminary Screening of Remedial Technologies			Remedial Technology and Process Options Screening Criteria ⁽¹⁾							
			Description	Retained	Retained/Rationale	Effectiveness Evaluation		Implementability Evaluation		Cost Evaluation		Retained	
Disposal/Discharge	Disposal	Off-Site Landfill	Off-site disposal of excavated soil at an approved landfill	Yes	Well established technology for disposal of impacted soil	Moderate/High	Removal of constituents from site reduces toxicity and volume of constituents	Moderate	Standard construction equipment, but characterization required to find appropriate disposal facility; potentially difficult to find a facility that can receive such a large volume of impacted material; implementability reduced by limited truck access to site	Moderate/High	Capital - Dependent on volume and waste characterization (hazardous/non-hazardous) O&M - Low to None	Yes	Standard disposal method applicable to all constituents
		Off-Site Incineration	Incineration of excavated soil or remedial process residuals in an approved incineration facility.	Yes	Technology is applicable for most site constituents except inorganics, which would require disposal.	Moderate/High	Removal of constituents from site reduces toxicity and volume of constituents	Moderate	Standard construction equipment, but characterization required to find appropriate disposal facility; implementability reduced by limited truck access to site	Moderate/High	Capital - Dependent on volume and waste characterization (hazardous/non-hazardous) O&M - Low to None	No	Technology is not applicable for inorganics, which would still require off-site disposal. Therefore, incineration offers no benefit over simple off-site disposal.
		On-Site Consolidation	Excavate and relocate soil on-site for further, long-term management (e.g., containment).	Yes	Well-established technology for management of impacted soil	Moderate	Reduction of extent/area of impacted material; may be combined with other soil treatment or containment technologies	Moderate/High	Standard construction equipment; liner may be required under impacted materials to prevent migration of constituents to groundwater	Moderate	Capital - High O&M - Low to None	Yes	Standard, proven disposal method; implemented with containment
		Backfilling Excavation	Backfilling with clean fill	Yes	Well-established technology for restoring excavated area; combine with excavation or other disposal technologies	Moderate	May be combined with other soil treatment or containment technologies	Low/Moderate	Potentially unfeasible due to site size/volume of soil required; implementability reduced by limited truck access to site	Moderate	Capital - Moderate (soil sampling and handling) O&M - Low to None	Yes	Less feasible than other disposal options
		Soil Reuse	Reuse of treated soils as fill or cover material in a landfill	No	Ex-situ treatments required to allow soil reuse are not applicable to the site because material is a mixture of waste and soil	-	-	-	-	-	-	-	-

Notes

- (1) Per USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October 1988.
(2) Remedial Technology/Process Options list developed from Tables 4 and 5 of *Rolling Knolls Landfill Superfund Site Technical Memorandum on Candidate Technologies*.